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EXAMINER	
MALKOWSKI, KENNETH J	
ART UNIT	**PAPER NUMBER**
2613	

SHORTENED STATUTORY PERIOD OF RESPONSE	MAIL DATE	DELIVERY MODE
3 MONTHS	01/17/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

If NO period for reply is specified above, the maximum statutory period will apply and will expire 6 MONTHS from the mailing date of this communication.

Office Action Summary	Application No. 10/668,818	Applicant(s) RICE ET AL.	
	Examiner Kenneth J. Malkowski	Art Unit 2613	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *07 November 2006*.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☐ Claim(s) _____ is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-7,10-15,17 and 18* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *31 October 2006* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Claim Rejections - 35 USC § 112

1. The following is a quotation of the first paragraph of 35 U.S.C. 112:

> The specification shall contain a written description of the invention, and of the manner and process of making and using it, in such full, clear, concise, and exact terms as to enable any person skilled in the art to which it pertains, or with which it is most nearly connected, to make and use the same and shall set forth the best mode contemplated by the inventor of carrying out his invention.

2. Claim 1 recites the limitation "said refractive index of doped cladding layer" in line 17 of claim 1. There is insufficient antecedent basis for this limitation in the claim.

Claim Rejections - 35 USC § 103

3. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1-6, 10-14 and 17 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0105704 to Numata et al. in view of U.S. Patent No. 5,488,506 to Krisvoshlykov et al.

With respect to claims 1-2, Numata discloses a system for high speed data transmission (optical transmission system, title) comprising: a light source for transmitting data (111, Figure 1 (labeled light emission element)); a lens (112, Figure 2) having a focal length f for receiving said first light source from said light source, said lens being approximately said focal length f from said exposed core of said large core multimode fiber optic cable (Z1, Figure 2)(abstract, vertex

of lens 112 and an input plane of the multi-mode fiber), a large core multimode fiber optic cable (12, Figure 1), comprising:

An exposed core having a core diameter (Figure 2 displays the shaded region in fiber 12 as the core which is exposed to light source 111, wherein any core inherently has a diameter as shown) wherein said light (applicant characterizes the first light after having gone through said lens as a second light) signal received from said lens (OSin, Figure 2) at the exposed core (Fin, Figure 2 is the input plane of the exposed core displayed in Figure 2)(page 3 paragraph 37) is focused on and has a diameter approximately equal to said core diameter to reduce excitation of higher order modes (Figure 2 light from lens 112 is shown entering the exposed core of multimode fiber optic cable 12 wherein the diameter of the light is approximately equal to the core, give or take a margin of error))(page 4 paragraph 46 (explains how prior art had the light diameter much smaller than the diameter of the core as shown in Figure 14, but that this situation causes excitation of higher order modes which is the result of mode dispersion. Numata goes on to explain that these higher order modes are reduced to a minimum when the diameter of the light matches the diameter of the core as shown in Figure 2 and also explained by Figure 4))(page 4 paragraph 53 (as Nain decreases, so does dispersion))(pages 4-5 paragraph 55 (S(z1) is equal to Sf, as shown in Figure 6 means the diameters are equal));

However, Numata does not specifically disclose that a refractive index of said exposed core is substantially real to propagate said light with low loss and said refractive index of said doped cladding layer includes a complex component that attenuates higher order modes such that said light signal (applicant characterizes the first light after having gone through said lens and fiber as a third light) output by said large core multimode fiber optic cable includes substantially

only lower order modes by attenuating higher order modes. Despite this such a use of refractive index is well known in the art and is not considered a patentably distinct limitation. Krisvoshlykov, from the same field of endeavor discloses a refractive index of said core is substantially real to propagate said light signal with low loss and wherein said refractive index of said cladding layer includes a complex component that attenuates higher order modes generated in said large core multimode fiber optic cable (column 3 lines 27-38 (there is a Δn difference between the core an cladding refractive indices, the gradient parameter ω are complex numbers, the real parts of these numbers describe index guiding properties of the fiber)(column 3 lines 45-53 (imaginary parameter characterizes the gain guiding properties of the fiber. The gain guiding properties for different modes are different, the lower modes exhibit larger gain than the higher order modes)). Therefore, it would have been obvious to one of ordinary skill in the art to implement the complex component in said cladding as taught by Krisvoshlykov in the fiber optic cable as taught by Numata. The motivation for doing so would have to further reduce higher order mode propagation (column 3 lines 51-53).

With respect to claim 3, Numata in view Krisvoshlykov of discloses the system for high-speed data transmission as recited in claim 1 wherein said light source is a diode laser (Numata: page 2 paragraph 35 (laser diode)).

With respect to claim 4, Numata in view Krisvoshlykov discloses the system for high-speed data transmission as recited in claim 1 wherein light source is a light emitting diode (Numata: page 2 paragraph 35 (light emitting diode)).

With respect to claim 5, Numata in view Krisvoshlykov discloses the system for high-speed data transmission as recited in claim 1, however, Numata fails to specifically disclose wherein said light source provides light having a wavelength greater than 750 nanometers. Despite this, transmitting light at a wavelength greater than 750 nanometers is notoriously well known in the art, is very commonly used in the majority of light transmission applications and does not constitute a patentably distinct limitation. The motivation for transmitting a wavelength at greater than 750 nanometers is because of its favorable signal loss and dispersive properties.

With respect to claim 6, Numata in view Krisvoshlykov discloses the system for high-peed data transmission as recited in claim 1, however, Numata fails to specifically disclose wherein said light source transmits data at greater than 10 gigabits per second. Despite this, the ability to transmit data at greater than 10 gigabits per second is standard in fiber optic technology and does not constitute a patentably distinct limitation. The motivation for including a transmitter that can transmit at greater than 10 gigabits per second would be for the obvious advantage of receiving information faster than if data were transmitted at below 10 gigabits per second.

With respect to claim 10, Numata in view of Krisvoshlykov discloses the system for high speed data transmission as recited in claim 1 further including a receiver coupled to an opposing end of said large core multimode fiber optic cable for receiving said transmitted data (Numata: 22, Figure 7).

With respect to claims 11 and 16, Numata discloses a method for increasing a length/data rate product for a large core multimode fiber optic cable (applicant states on page 9 paragraph 27 that increasing length/data rate product inherently occurs when higher order modes are attenuated. Numata discloses reducing higher order modes on page 4 paragraph 51) comprising

the steps of: providing a data transmission comprising a sequence of light pulses ((111, Figure 21 (light emission element)); collimating light of said data transmission to minimize excitation of higher order modes in the large core multimode fiber optic cable (page 4 paragraph 51 (having a optical signal with a numerical aperture not larger than the numerical aperture of the input plane of the multimode fiber core the higher order modes in the optical signal are decreased, so that the mode dispersion can be reduced)); focusing said light pulses onto an exposed end of a core of the large core multimode fiber optic cable such that a diameter of a light pulse is approximately equal to a core diameter of the large core multimode fiber optic cable (Figure 2 light from lens 112 is shown entering the exposed core of multimode fiber optic cable 12 wherein the diameter of the light is approximately equal to the core, give or take a margin of error))(page 4 paragraph (light diameter in relationship to the core diameter can be oriented to control dispersion and transmission distance))(page 4 paragraph 55 (NA s is equal to or less than NA f)); and attenuating higher order modes of said light pulses as said data transmission propagates down the large core multimode fiber optic cable (page 4 paragraph 51 (the diameter of the entering light and of the core of the fiber effect how the transmission data propagates down the fiber and therefore attenuation of higher order modes))(Figure 9 depicts the difference between how high and low order modes propagate down a fiber)).

However, Numata does not specifically disclose a doped cladding layer including a complex component that attenuates higher order modes such that said light signal output by said large core multimode fiber optic cable includes substantially only lower order modes by attenuating higher order modes. Despite this such a use of a doped cladding layer is well known in the art and is not considered a patentably distinct limitation. Krisvoshlykov, from the same

field of endeavor discloses a cladding layer including a complex component that attenuates higher order modes generated in said large core multimode fiber optic cable (column 3 lines 27-38 (there is a Δn difference between the core an cladding refractive indices, the gradient parameter ω are complex numbers, the real parts of these numbers describe index guiding properties of the fiber)(column 3 lines 45-53 (imaginary parameter characterizes the gain guiding properties of the fiber. The gain guiding properties for different modes are different, the lower modes exhibit larger gain than the higher order modes)). Therefore, it would have been obvious to one of ordinary skill in the art to implement the complex component in said cladding as taught by Krisvoshlykov in the fiber optic cable as taught by Numata. The motivation for doing so would have to further reduce higher order mode propagation (Krisvoshlykov: column 3 lines 51-53).

With respect to claim 12, Numata in view of Krisvoshlykov discloses the method for increasing a length/data rate product for a large core multimode fiber optic cable (Numata: 12, Figure 1) as recited in claim 11 further including using a lens to collimate and focus said light pulses to the large core multimode fiber optic cable (Numata: Figure 14 (axis of light signal is made parallel to axis of fiber core))(Numata: page 1 paragraph 11 (the optical axis is aligned with the fiber axis so that they are on a straight line)).

With respect to claim 13, Numata in view of Krisvoshlykov discloses the method of increasing a length/data rate product for a large core multimode fiber optic cable as recited in claim 11 further including a step of increasing a signal level of said data transmission to compensate for propagation loss thereby further increasing a transmission distance through the

large core multimode fiber optic cable (Numata: Figure 4 depicts realizable transmission distance for discernable transmission data and relative optical power))(Numata: page 4 paragraph 54 (changing the relative position of the input plane affects transmission distance and data rate of the optical signal))(Numata: page 5 paragraph 60 (present invention reduces of mode dispersion based on adjustment of position Z1, thereby increasing the transmission distance)).

With respect to claim 14, Numata in view of Krisvoshlykov discloses the method of increasing a length/data rate product for a large core multimode fiber optic cable as recited in claim 11 further including a step of using a core greater than 50 microns in diameter in the large core multimode fiber optic cable (Numata: page 1 paragraph 6 (multi-mode fiber ahs a core diameter of 50 μm to 1 mm)).

With respect to claim 17, Numata in view of Krisvoshlykov discloses the system for high-peed data transmission as recited in claim 16, however, Numata fails to specifically disclose wherein said light source transmits data at greater than 10 gigabits per second. Despite this, the ability to transmit data at greater than 10 gigabits per second is standard in fiber optic technology and does not constitute a patentably distinct limitation. The motivation for including a transmitter that can transmit at greater than 10 gigabits per second would be for the obvious advantage of receiving information faster than if data were transmitted at below 10 gigabits per second.

5. Claim 7 is rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0105704 to Numata et al. in view of U.S. Patent No. 5,488,506 to Krisvoshlykov et al. and further in view of U.S. Patent No. 6,476,951 to White et al.

With respect to claim 7, Numata in view of Krisvoshlykov discloses the system for high-speed data transmission as recited in claim 1, however, does not specifically mention a launching

power. Despite this transmission power being launched at 20 dBM or greater is well known in the art and does not constitute a patentably distinct limitation. White from the same field of endeavor discloses a signal level from said light source is launched to said large core (abstract (50-62.5 microns)) multimode fiber optic cable (abstract (multimode optical fiber)) at greater than 20 dBM (column 7 lines 10-19 (transmitters are configured to transmit signals at a launch power level up to 20dB greater than required by typical communication protocols)). Therefore, it would have been obvious to one of ordinary skill in the art to transmit at a launch power level of 20 dbM or greater as is taught by White. The motivation for doing so would have been to compensate for high amounts of fiber attenuation (column 6 lines 46-56).

6. Claims 15 and 18 are rejected under 35 U.S.C. 103(a) as being unpatentable over U.S. Patent Application Publication No. 2002/0105704 to Numata et al. in view of U.S. Patent No. 5,488,506 to Krisvoshlykov et al. and further in view of U.S. Patent No. 6,751,388 to Siegman et al.

With respect to claim 15, Numata in view of Krisvoshlykov discloses the method of increasing a length/data rate product for a large core multimode fiber optic cable as recited in claim 11, however, Numata in view of Krisvoshlykov fails to disclose further including a step of using a step index fiber optic cable having a doped cladding layer for absorptive attenuation of higher order modes. Seigman, from the same field of endeavor discloses a step of using a step index fiber optic cable having a doped cladding layer for absorptive attenuation of higher order modes (column 1 lines 36-47 (step index exists between the core and cladding regions such that the result is no higher-order modes are able to propagate or be trapped by the fiber))(column 3 lines 47-58 (fiber has a core, cladding and a doping profile distributed between said core and

cladding to create a doping profile which defines the gain properties of modes))(column 11 lines 50-54 (well known principles dictate the result of doping the cladding layer)). Therefore, it would have been obvious to one of ordinary skill in the art to implement the doped cladding layer to reduce higher order modes as taught by Seigman in the fiber optic cable as taught by Numata in view of Krisvoshlykov. The motivation for doing so would have been to reduce the amount of mode mixing and randomization of propagating modes to reduce dispersion (Seigman: column 7 lines 1-15).

With respect to claim 18, Numata in view of Krisvoshlykov discloses the method of increasing a length/data rate product of a large core multimode fiber optic cable as recited in claim 17, however, Numata fails to specifically disclose further including a step of using a step index large core multimode fiber optic cable. Seigman, from the same field of endeavor discloses using a step index in said fiber optic cable (column 4 lines 19-23 (index profile is a step index profile, with the core having a higher index and the cladding having a lower index)). Therefore, it would have been obvious to one of ordinary skill in the art to implement the step index as taught by Seigman in the fiber optic cable as taught by Numata. The motivation for doing so would have been to reduce the amount of mode mixing and randomization of propagating modes to reduce dispersion (Seigman: column 7 lines 1-15).

Response to Arguments

7. Applicant's arguments with respect to claims 1-18 have been considered but are moot in view of the new ground(s) of rejection.

Although the arguments are moot in view of the new grounds of rejection it is important to point out that the assertion made by applicant on page 12 paragraph 3 which states that,

"Numata et al. show that the light signal received from said lens at the exposed core is not focused on the MMF 12 such that it has a diameter approximately equal to said core diameter," is incorrect. Numata definitively teaches (Figure 2 light from lens 112 is shown entering the exposed core of multimode fiber optic cable 12 wherein the diameter of the light is approximately equal to the core, give or take a margin of error))(page 4 paragraph 46 (explains how prior art had the light diameter much smaller than the diameter of the core as shown in Figure 14, but that this situation causes excitation of higher order modes which is the result of mode dispersion. Numata goes on to explain that these higher order modes are reduced to a minimum when the diameter of the light matches the diameter of the core as shown in Figure 2 and also explained by Figure 4))(page 4 paragraph 53 (as Nain decreases, so does dispersion))(pages 4-5 paragraph 55 (S(z1) is equal to Sf, as shown in Figure 6 means the diameters are equal) and shows in Figures 2 and 5 a light signal diameter approximately equal to the core diameter.

Conclusion

8. Applicant's amendment necessitated the new ground(s) of rejection presented in this Office action. Accordingly, **THIS ACTION IS MADE FINAL**. See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37

CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

9. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Kenneth J. Malkowski whose telephone number is (571) 272-5505. The examiner can normally be reached on M-F 8:30-5:00.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Ken Vanderpuye can be reached on (571) 272-3078. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

KJM 1/10/07

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